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POLITICAL AND SOCIOLOGICAL

OPPOSITION MOTION ON FOOD SELF-SUFFICIENCY PASSED

OW081227 Tokyo KYODO in English 1214 GMT 8 Apr 80 OW

[Text] Tokyo April 8 KYODO--The House of Representatives unanimously passed a resolution Tuesday calling on the government to strive for self-sufficiency in foodstuff production and carry out thorough measures to develop the Japanese agricultural and fishery industries.

The resolution, titled "A Resolution Concerning the Strengthening of Food Self-Sufficiency", was initiated by opposition parties.

As a result of the passage of the resolution, three bills related to increased use of farmland were referred to the agricultural and fishery committee without having them explained at a plenary session.

The resolution noted that the Japanese agricultural and fishery industries are in a "severe situation" and that farming households are facing a "serious trial" because of the government's policy of reducing paddy fields.

It also said that the degree of food self-sufficiency has declined in the face of increased imports of agricultural and livestock products.

The resolution said that the nation's fishing industry is faced with the necessity of working out severe countermeasures in the current era of 200 mile economic zones.

It noted that Japan ranks below other industrially advanced nations in food self-sufficiency.

To provide the people with a steady food supply is an emergency matter in national politics.

The government should try to strengthen food self-sufficiency as a means of establishing a secure structure for the national livelihood, according to the resolution.

It also said the government should work out thorough measures to develop the nation's agricultural and fishery industries.

CSO: 4120

MILITARY

F-15 MAINTENANCE TRAINING TO START THIS SUMMER

Tokyo JPE AVIATION REPORT-WEEKLY in English 2 Apr 80 p 5

[Text]

The Air Self-Defense Force (ASDF) will start training maintenance engineers for F-15 fighters at the 1st ASDF Service School in Hamamatsu this summer prior to the new fighters' arrival in Japan beginning at the end of FY 1980 (April 1980-March 1981)

The first group out of about 70 engineers now training in the United States will return home in late March, and training equipment will be delivered to the school from late March to June.

The ASDF will also send three pilots to the United States in the beginning of FY 1980 (April '80 - March '81) and four others by the end of December for training there. They will use F-15s which the ASDF will receive from the US Air Force. The first three pilots will conduct technical and operational tests. The four others will train to become instructors for domestic training.

CSO: 4120

MILITARY

FY 1980 MILITARY R&D PROGRAMS RUNDOWN

Tokyo JPE AVIATION REPORT-WEEKLY in English 2 Apr 80 pp 6-9

[Text]

The Technical Research & Development Institute (TR&DI) of the Japanese Defense Agency (JDA) is authorized ¥28,770 million in the FY 1980 defense budget outlay, a 7.2 percent increase over the previous fiscal year. Of the ¥28,770 million, ¥22,508 million or 78.2 percent are for R&D programs, an increase of 10.6 percent over FY 1979.

A significant feature of the R&D funds for FY 1980 is a substantial increase of "Theme Studies" (Meidai Kenkyu) or TR&DI's independent in-house research programs. Funds for "Theme Studies" total ¥2,257 million for five programs in FY 1980 compared to ¥917 million for three programs in FY 1979. "Theme Studies" for FY 1980 include continued efforts for the CCV (control-configured vehicle), and laser radars, as well as new programs such as the SR (soft recoil) self-propelled gun.

Major programs to meet requests from ground, maritime, and air self-defense forces cover continuation of work for a next GSDF main battle tank, a high-speed MSDF homing torpedo, an autopilot system for the ASDF F-1 support fighter, as well as new projects for development of an electronic communications exchange system for GSDF divisions, a small turbofan engine for a future ASDF trainer, and other items.

Rundown of these R&D programs for FY 1980 follows:-

Aircraft & Engine

Efforts to develop a CCV (control-configured vehicle) will continue from FY 1979 as a major "Theme Study" on highly maneuverable small aircraft of the future. Development of an autopilot system for installation on the ASDF F-1 support fighter enters its second year. The automatic flight control system is scheduled for completion in FY 1981.

One of the most important new programs of the TR&DI, development of a small turbofan engine starts in FY 1980, with a goal to obtain an optimum engine to power the MT-X, ASDF's next intermediate trainer to replace the Lockheed T-33A and Fuji T-1A/B trainers in late '80s.

Guided Weapons

Programs are continuation of work on various guided missiles.

The Chu(Medium)-MAT program is for a new GSDF antitank missile with a semi-active laser-homing system. The medium-range missile is said to be so compact a man can carry three. It will be fired at a steep angle by a team consisting of a missile guidance operator and the firer. It will become standard equipment of antitank units in GSDF divisions.

A new surface-to-ship missile, also for the GSDF, is intended to destroy hostile ships in coastal waters from ground bases. Developed from the ASM-1 air-to-ship missile for use with the ASDF F-1 support fighter, it will be powered by a small jet engine ---a "cruise missile" in the weapons inventory of the Self-Defense Forces. Design work was completed in FY 1979 and basic components of the missile will be fabricated during FY 1980. Terminal guidance of the missile will be controlled by a ground-based center. The program calls for joint efforts by various manufacturers as was the case with the ASM-1.

Guns & Vehicles

Programs will continue to modernize equipment of the GSDF.

Work for development of a new main battle tank, tentatively coded the Model 88 (for service adoption in 1988) advances in FY 1980 to fabrication stages for suspension systems, armor, and ammunition for the main gun, following studies on the turret system and powerplant. Alternate suspension systems are being considered, including hydraulic and torsion-bar systems. For the "Model 88" MBT, a three-layer armor plate of sandwich construction of steel and ceramic material is being studied, instead of a conventional single-layer steel plate. Two types of ammunition for the 120mm smooth-bore gun of the new tank are under development. The HEAT (high explosive, antitank) ammunition is being successfully developed, while the APDS-FS high-speed fin-stabilized armor-piercing ammunition requires further testing.

Ships & Underwater Weapons

The Model 73 torpedo modification program enters the development phase in FY 1980 from the research phase. An improved guidance control system was fabricated last year and system integration will be carried out in FY 1980. The program is intended to improve accuracy. The torpedo will be launched from either aircraft or ships, to attack high-speed submarines.

Another torpedo program to continue in FY 1980 is for a high-speed long homing torpedo. It will be a very accurate torpedo to be launched from submarines against both surface ships and high-speed submarines.

Another program continues on development of an inertial navigation system for use by submarines. It will enable a submarine to establish its precise position even while submerged.

Construction of an experimental mine-sweeper hull model with FRP (forced resin plastic) materials will be carried out in FY 1980. The one third scale model (150 tons) mine-sweeper hull will be built with highly nonmagnetic and durable FRP materials. A life-size engine room model using FRP material was built in FY 1978. At present, the FRP material is used for surfaces of 5-inch gun turrets on MSDF destroyers.

Communications & Electronics Equipment

An important new program in FY 1980 calls for development of an automatic digital communications exchange system that will replace the analog system currently in service. The new system is intended to provide fast and precise information processing between the GSDF centrol command and divisional commands throughout Japan.

For the ASDF, two ECM (electronic counter measure) systems are being developed. The ALQ-5 system is to jam ground-based surveillance radars and SAM guidance radars. It will be installed on a C-1 jet transport for ECM training. The ALQ-8 system, which is smaller than the ALQ-5, is for use with the ASDF F-15 fighter aircraft. It will be used to jam fire control systems of hostile aircraft as well as homing heads of hostile SAMs.

Theme Studies

A new program to start in FY 1980, a study on a soft recoil (SR) self-propelled cannon is to explore possibilities of mounting large guns on a light-weight self-propelled chassis.

Studies on a laser radar system in FY 1980 includes two new ones in addition to a continued program. An experimental system will be fabricated for basic studies such as propagation characteristics of lasers. The system can be mounted on a vehicle or a ship. Its range is said to be 10 to 20 kilometers.

Component development will continue for the CCV (control-configured vehicle). Designing and fabrication of the FBW (fly-by-wire) control system, aerial combat flaps, and canard wings will be carried out. These and associated components and parts will be installed on an ASDF T-2 supersonic trainer. Flight tests of the T-2 CCV aircraft are scheduled for FYs 1983-84.

Studies on a portable surface-to-air guided missile will continue for an advanced individual antiaircraft weapon system for the GSDF. Major components such as the guidance control system will be fabricated in FY 1980.

CSO: 4120

MILITARY

ASDF AND GSDF TO FINALIZE PORTABLE SAM SELECTION IN FY'80

Tokyo JPE AVIATION REPORT-WEEKLY in English 2 Apr 80 pp 5, 6

[Text]

So procurement programs can start in FY 1981, both the ASDF and the GSDF will finalize selection of portable surface-to-air missiles during FY 1980. The ASDF intends to deploy portable SAMs for defense of its air bases and radar sites, while the GSDF plans to equip artillery units for increased air defense power.

Listed as candidates are the US Army/General Dynamics FIM-92A Stinger, the Bofors RBS 70, and the Short Brothers Blowpipe. It is, however, reported that the RBS 70 has little chance since it is not a simple man-portable, shoulder-launched weapon system.

Some quarters within the Defense Agency advocate adoption of a common missile among the ASDF and the GSDF for cost effectiveness and operational advantages. It is, however, not certain whether the ASDF and the GSDF can satisfy their respective requirements with a common SAM.

Apart from the foreign portable SAM, the GSDF and the ASDF plan to start procurement of the Tan-SAM in FY 1981 for use against low-flying hostile aircraft at short range. This may make funds available for the foreign portable SAM quite tight. It is probable that only a few units of the selected SAMs will be ordered in FY 1981 for evaluation or training purposes.

CSO: 4120

MILITARY

FOREIGN MINISTRY URGING UPGRADING MTDP

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 5

[Text]

A Foreign Ministry official said in late March that the government should adopt the Japanese Defense Agency's (JDA) Medium-Term Defense Program (MTDP) as its official plan, suggesting the MTDP be upgraded to the virtual "5th Defense Buildup Program (DBP)."

The MTDP has been drafted as a follow-up to the 1st-4th DBPs ending in FY 1976 by the JDA based on the basic defense plan outline approved by the government in October 1976. The MTDP aims at improving quality of the Self-Defense Forces' main equipment at cost of ¥2,800,000 million over five years. It presupposes the nation's defense spending will be raised to one percent of the gross national product (GNP) by FY 1984 from the current 0.9 percent.

The Foreign Ministry official's remark may have come in response to the United States' demand for Japan's increased defense efforts. When Foreign Minister Saburo Okita visited Washington March 19-22, US Defense Secretary Harold Brown demanded Japan push a "steady and significant" increase in defense spending. Specifically, he suggested advanced implementation of the FY 1980-84 MTDP. Okita gave him a promise on the "steady" increase.

Noting the MTDP fully observes the Cabinet's decision to hold defense spending to one percent of the GNP, the official explained it requires spending to be increased by 0.02 percent of the GNP or about ¥400,000 million per year during the five years. He said this remains within the scope of the "steady" increase, indicating Okita's promise means implementation of the MTDP. The Foreign Ministry agrees with State Minister for Defense Kichizo Hosoda on this point, he added.

However, the Finance Ministry said it would be difficult to incorporate the MTDP into a budget at a time when the national finance is plagued by deficits, hinting at difficulties in coordination of views within the government. Furthermore, the problem is expected to add fuel to the debates on national defense at the Diet.

In view of these difficulties, the Foreign Ministry official said the contents of the MTDP may have to be reconsidered, and that the government will reveal a unified view on this when it drafts the FY 1981 (April 1981-March 1982) budget at the end of this year. He thus indicated even if the MTDP is authorized as an official plan, there would be a long period before actual authorization.

CSO: 4120

MILITARY

ASDF STUDYING RF-X SELECTION

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 6

[Text]

The ASDF plans to increase its reconnaissance force from 14 RF-4Es to 24 aircraft and it is now studying various types.

For early introduction, the RF-4E is considered. It can be obtained through modification of the F-4EJ fighter. A plan to modify the T-2 supersonic trainer has been dropped. Another plan to procure the RF-15 is becoming unrealistic as the USAF appears against using such a high performance and costly fighter for reconnaissance missions. The USAF is reportedly eyeing continued operation of the Lockheed SR-71 for strategic reconnaissance and the McDonnell Douglas RF-4 and the Northrop RF-5 for tactical reconnaissance missions.

Before the ASDF decides on the RF-4E, however, it must review plans to maintain ten fighter-interceptor squadrons in frontline service. The ASDF is currently pushing plans to increase deployment of the F-15 fighter from the authorized 100 to 123 aircraft in order to cover the loss of an F-4EJ squadron. If further F-4EJs are retired for conversion to RF-4Es, the ASDF will require more F-15s.

The RF-4E currently in service will have to be phased out in the late '80s and the RF-X must be selected not only to augment but also to replace it. In this regard, the ASDF will have to finalize at least qualitative requirements for inclusion in the FY 1981 Medium-Term Defense Program, FYs 1983-87.

CSO: 4120

MILITARY

GSDF COMPLETES BELL AH-1S OPERATIONAL TESTS

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 7

[Text]

The GSDF successfully completed operational tests using a single Bell AH-1S antitank helicopter with firing tests at the Mt. Fuji East range on March 24 and 26. The AH-1S has logged a total of 350 flight hours since tests began in June 1979. A report on operational tests was submitted by the GSDF Aviation School to the Chief of Ground Staff at the end of March.

The GSDF intends to start fullscale procurement of the AH-1S helicopter in FY 1981 and the report will serve as a major reason for finalizing plans to activate 3.5 squadrons of the antitank helicopter.

It is, however, uncertain whether the internal bureaus of the JDA will be satisfied with test results obtained from a single AH-1S. They have been demanding that the GSDF show test results of formation operation of the antitank helicopter. A second AH-1S is due in April for such tests which will last until July. For preparing funding requests in the FY 1981 budget, however, the GSDF has no time for completion of such tests. If it waits, it may loose its chance to realize start of the AH-1S program in FY 1981.

The GSDF, under the circumstances, is expected to use the report on a single AH-1S as a basis for its plans with results of formation operation tests as supplementary data.

CSO: 4120

BRIEFS

NEW ASW HELICOPTER--MSDF plans for the FY '78 MTDP (FYs 1980-84) call for procurement of 96 operational aircraft including two new helicopters for study as replacements for the HSS-2Bs. During FY 1980, the MSDF plans to send a team overseas to study new antisubmarine helicopters and then decide whether to procure sample units the following year. The HSS-2B is the latest ASW helicopter of the MSDF. Fifty-one will be procured during the FY '78 MTDP. A new ASW helicopter to succeed the HSS-2B, according to sources, will have better maneuverability but it will be equipped with common avionics. This indicates that the MSDF may select a foreign helicopter for local conversion to match the HSS-2B avionics to obtain a unique ASW helicopter. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 6]

GRENADE RIFLE TESTS--The GSDF has successfully completed operational tests of a new grenade launching rifle. It is now expected that the GSDF will proceed with plans to adopt it as a standard infantry weapon during FY 1980. Fullscale procurement is expected to start in FY 1981. Development of the grenade launching rifle began in FY 1974. The GSDF/TR&DI project was joined in by Nissan Motor, Daikin Kogyo, and Howa Kogyo. It weighs less than 10 kilograms and has a range of 400 meters, according to sources. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 7]

CSO: 4120

ECONOMIC

ASAHI TO OPERATE HELICOPTERS IN OIL EXPLORATION

Tokyo JPE AVIATION REPORT-WEEKLY in English 2 Apr 80 pp 3, 4

[Text]

Asahi Helicopter Co. has been awarded a contract for helicopter operations in Japan-South Korea joint offshore oil exploration under the bilateral continental shelf development agreement.

Japan Petroleum Development Co. (JPDC) the Japanese leader in the oil exploration project, notified Asahi Helicopter March 19 of its successful bidding in a tender earlier in March.

According to a plan announced by JPDC, Asahi Helicopter will operate an Aerospatiale SA330 Puma helicopter between Cheju Island of South Korea as an onshore base and two offshore oil drilling rigs for six months from May 1. It will take three months to drill one well.

The Puma is equipped with automatic flight control, Omega navigation, radar and other instrument flight systems as well as addtional fuel tanks to ensure safety in long-range offshore flights. It can transport 17 persons each on 315- and 360-kilometer routes between the island and rigs in 80 to 90 minutes. Two pilots and as many maintenance engineers will be stationed on the island.

South Korea announced last week Korean Airlines (KAL) would be awarded a similar contract by the Korean side. As KAL has concluded a contract with Asahi Helicopter for joint helicopter operations in the oil exploration project, the Puma will be used by the Korean side as well.

CSO: 4120

ERAAE TO REPRESENT JAPANESE INDUSTRY IN RJ 500 PROGRAM

Tokyo JPE AVIATION REPORT-WEEKLY in English 2 Apr 80 p 5

[Text]

The Ministry of International Trade and Industry (MITI) has tentatively selected the Engineering Research Association for Aerojet Engines (ERAAE) to represent Japanese interests in the Rolls-Royce/Japan RJ500 engine development program.

The association will receive government loans after passage of the FY 1980 budget while determining research and financial shares of IHI, KHI and MHI who will also participate. ERAAE was founded in 1971 for MITI's fanjet engine program, which is to end in FY 1980.

So far, MITI has considered a joint organization of the three firms or CTDC as the Japanese representative in the RJ500 program. However, it eventually picked ERAAE as the participating Japanese firms were not able to coordinate their views. But, the tentative designation leaves open the possibility of the three companies forming a new organization in the future to take over ERAAE's place.

The RJ500 program will start simultaneously with enactment of the FY 1980 budget in April as a joint venture of Rolls-Royce and the three Japanese companies and will be inaugurated following the designation of the Japanese representative. The joint venture, named "Rolls-Royce and Japanese Aero Engines Limited," will be based at Derby, England. A.R.G. Raeburn, Vice Chairman of Rolls-Royce, will be appointed Chairman of the joint venture, and Osamu Nagano, Adviser to IHI and Chairman of ERAAE, Vice Chairman.

Under the Japan-South Korea joint project for the next five years, the two countries will drill two wells a year. If they strike oil sufficient for commercial production, helicopters will be used on a permanent basis in tandem with offshore platforms being built at production sites.

As of 1979, there was only one offshore oil drilling rig in Japanese waters. However, demand for helicopters for offshore oil exploration assistance is expected to increase in waters around Japan in the 1980s as drilling is expected to start in the Gulf of Bohai as well as on the continental shelf between Japan and South Korea.

CSO: 4120

NIHON KAMOTSU KOKU STARTS SALES PRESENTATIONS

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 1

[Text]

Nihon Kamotsu Koku (Japan Air Cargo) started sales presentations in late March to air cargo agents and mixed cargo forwarders in Hong Kong and Singapore. It is learned that NKK explained to prospective customers that it would obtain license to start its international air cargo business "in the latter part of this year or in early 1981." NKK will initially operate two Boeing 747F freighters on "dry lease" from All Nippon Airways (ANA) for six weekly flights between Tokyo and New York via San Francisco. Later, a further 747F will be introduced for service between Tokyo and New York via Anchorage, according to NKK's prospectus.

The preliminary sales campaign of NKK followed a decision by the Ministry of Transport (MOT) not to issue a business license that would permit NKK to start business on April 1, the first day of FY 1980. Application for a business license was submitted to MOT in June 1978 from the air freight company which was formed jointly by ANA and four shipping companies---Nippon Yusen K.K., Mitsui O.S.K. Lines, Ltd., Yamashita-Shinnihon Steamship Co., and Kawasaki Kisen, Ltd.

NKK's aggressive sales efforts indicate that MOT's current policies to restrict regular international passenger and cargo services to Japan Air Lines only may be easing.

CSO: 4120

ECONOMIC

SJAC TO ESTABLISH 'ADVANCED AIRCRAFT TECHNOLOGY CENTER'

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 3

[Text]

The Society of Japanese Aerospace Companies (SJAC) plans to establish an "Advanced Aircraft Technology Center" in May to conduct research on elements for advanced aircraft of the 21st Century. Research will cover new materials for advanced aero engines and airframes, new flight control systems such as the FBW (fly-by-wire) system and improved total air transport systems including airports.

Five hundred million yen in SJAC's FY 1980 budget will go for the projected center, formal establishment of which will be decided at the SJAC's general meeting scheduled for May.

The center will be headed by a director who will be selected from well-experienced executives of the industry. A Planning Committee will be formed with 15 members to select research items and companies to assign such work to. The committee will also check the financial status of the center. Members will comprise representatives from SJAC-member companies as well as those from non-member organizations.

The "Advanced Aircraft Technology Center" is the latest in SJAC's efforts toward upgrading technical standards of the Japanese aircraft industry to the world level in the 21st Century.

CSO: 4120

ECONOMIC

FUJITSU APPROACHING GENERAL DYNAMICS FOR TIE-UP

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 4

[Text]

Fujitsu is approaching General Dynamics (GD) and other American weapons manufacturers for introduction of advanced technology for weapons systems in an effort to obtain a Japanese Defense Agency's (JDA) order for the "BADGE-X" system for automatic air defense to replace the current BADGE system.

Although Fujitsu is the largest maker of commercial computers, its defense-related sales, centering on data processing instruments, accounted for only ¥7,000 million or 1.4 percent of its overall sales in FY 1979 (April 1979-March 1980). In defense-related business, it ranks sixth among Japanese electronic machinery makers, following Mitsubishi Electric (MELCO), Toshiba, Nippon Electric (NEC), Hitachi and Oki Electric. MELCO's annual defense-related sales total more than ¥50,000 million.

However, Fujitsu plans to expand its defense-related business in anticipation of increasing demand for electronic weapons systems amid rising international tension. For that purpose, it has unified its special machinery headquarters and its defense system development division into "defense-related machinery headquarters." The new headquarters, for the immediate future, will strive to obtain the JDA's ¥200,000 million BADGE-X order. It also intends to start producing electronic systems for missiles.

The company's negotiation with GD and other American firms cover technology for communications between missiles and radar sites, development of all-weather air defense systems, and other techniques.

Fujitsu's technical tie-up with GD, if realized, would have a great impact on Japan's weapons system development because there are no Japanese companies having extensive technical cooperation contracts with the American firm at present.

Other Japanese firms eyeing the BADGE-X order include NEC, Toshiba, Hitachi and MELCO. The current BADGE system was completed by NEC, (in 1964), which introduced knowhow from Hughes Aircraft Co.

CSO: 4120

JETRO ISSUES REPORT ON LIGHT INDUSTRIAL EXPORTS

OW151117 Tokyo KYODO in English 1100 GMT 15 Apr 80

[Text] Tokyo April 15 KYODO--Exports of light industrial products have been picking up strongly after a slump in 1977 and 1978, the Japan External Trade Organization (JETRO) said Tuesday.

In a special report, titled the "State of Light Industrial Exports Against the Backdrop of a Recent Decline in the Yen's Value," the semigovernmental trade organization said that exports of light industrial commodities, produced mainly by smaller enterprises, slumped in 1977 and 1978 chiefly because of the yen's steep appreciation in those years.

But recently, they are recovering strongly with much of the pickup coming from a downturn in the yen's value since late in 1978, JETRO said. In terms of yen value, exports of the products ran ahead of the year-before levels by more than 10 per cent for five consecutive months between last September and January this year, it said.

Itemwise, exports of such commodities as glass tableware, guitars and colored glasses, are still remaining sluggish in the wake of the yen's appreciation between 1977 and 1978, but exports of metal flatware, binoculars, artificial pearls and toys have been increasing sharply in recent months in terms of volume, the report said.

The report said another important reason for the recent pickup in exports of light industrial products was an increase in the non-price competitiveness of these products as a result of efforts made by Japanese manufacturers to produce goods with high added value.

CSO: 4120

INDUSTRIAL PRODUCTION HITS 27 YEAR HIGH

OW160820 Tokyo KYODO in English 0750 GMT 16 Apr 80

[Text] Tokyo April 16 KYODO--Japan's industrial production recorded a surprising 5.7 per cent increase in February over a month ago, the biggest growth since March 1953, revised official figures showed Wednesday.

The Ministry of International Trade and Industry had estimated previously a 3.9 per cent rise in the mining and manufacturing output for February.

The revised figure was second only to 7.9 per cent increase recorded in March 27 years ago.

MITI said shipments also jumped from an estimated 4.0 per cent increase to seasonally adjusted final 5.3 per cent.

Inventory showed 0.3 per cent increase as estimated before.

MITI said the large increase in production was attributed to business boost in all industries except precision instruments and oil and coal products.

The shipment growth came from increases in all industrial sectors except oil and coal-related industries, MITI said.

Production rose 8.1 per cent in the transportation industry, 7.9 per cent in the general machinery, 7.7 per cent in the metal products, 7.3 per cent in the electric machinery, 7.3 per cent in chemicals and 7.1 per cent in the food industry, MITI said.

MITI said the industrial production index for the January-March period is expected to record a 3.6 per cent increase, which will push up the yearly growth for fiscal 1979 ending in March to 9.3 per cent.

MITI previously estimated the 1979 growth at 8.0 per cent.

MITI also said actual operational index for the mining and manufacturing was 93.1 per cent, second only to 93.5 per cent of November 1973.

Industrial activities are expected to show continued increase in the immediate future but not as steadily as in February, MITI predicted.

CSO: 4120

ECONOMIC

BRIEFS

UNEMPLOYMENT DECLINES--Tokyo, 28 Mar--The nation's unemployment rate in February declined to the 1.7-percent level for the first time in 4 years and 11 months and recorded 1.78 percent after seasonal adjustments, Director General Keizo Obuchi of the prime minister's office told the cabinet meeting Friday. Reporting on the monthly labor force survey, Obuchi said the decline reflected the continuing improvement in the labor situation with an increase noted in the number of workers in the manufacturing industry. The working force population (total number of workers and unemployed) in February was 54,500,000, or 450,000 (0.8 percent) more than in the same month of 1979. The number of unemployed totaled 1,110,000, or a sharp decrease of 8.3 percent when compared with a year ago. The jobless rate of 1.78 percent was the lowest since the 1.75 percent registered in March 1975. [OW281545 Tokyo KYODO in English 0156 GMT 28 Mar 80 OW]

NEW MILITARY TRANSPORT--Kawaski Heavy Industries Ltd (KHI) plans to propose to the Japanese Defense Agency a program to develop a modified version of the C-1 military transport. According to the KHI plan, the modified C-1 will be able to fly 1,400 to 1,500 km, carrying approximately 16 tons of cargo. It will probably be powered by the new engine which will be developed jointly by Rolls-Royce and Japanese industry, KHI said. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 2 Apr 80 p 5]

GOLD DISCOVERY--Kagoshima, Japan, April 15 (AFP)--A gold-mining company president in Kagoshima, Kyushu, southern Japan, said today that his company recently hit a new promising gold vein which he said was believed to be a sign of a large deposit having some 600 tons of gold worth about 3,000,000,000,000 yen (12,000 million dollars). Mr Shokichi Maeda, 73-year-old president of Higashi Yamagano Co., said that his firm has confirmed about 50 gold veins each stretching 3,000 meters from the east to the west in its Kagoshima field. After obtaining mining rights from the Kagoshima prefectural government, the company started prospecting the mine in June last year. Since then, it has mined 3,000 tons of ordinary gold ore containing 10 grams of gold per ton and about 30 tons of fine quality ore having 1,000 grams of gold per ton. Mr Maeda, who has been digging mines for gold for 40 years, said the newly-found vein convinced him that this mine in Kagoshima was the largest gold deposit in Japan. [Text] [OW151725 Hong Kong AFP in English 1720 GMT 15 Apr 80]

CSO: 4420

UNIVERSITY NUCLEAR FUSION PROGRAMS DESCRIBED

Tokyo KAGAKU SHIMBUN in Japanese 16 Nov 79 pp 5, 7-9

[Article by Kazuo Takayama, director, Institute of Plasma Physics, Nagoya University]

> [Text] Great Stride Made by Joint Research--Joint research has been in progress at the Institute of Plasma Physics since its founding in 1961 as the site of nationwide research. This joint research is one of the research promotion measures conceived in Japan. Fortunately, the effectiveness of this measure has been manifested in the results, and the actual state of research has been watched with amazement by overseas researchers. Research activities involving international cooperation began from this fiscal year mainly with the United States, but also include the USSR, Europe, and China. Cooperative research projects desired by other countries naturally concentrate at this research institute due to its mission of joint research use. However, as we hope for successful results in these research projects, the greatest problem is the fact that the scale of the Institute of Plasma Physics is too small. If our efforts are directed toward international cooperation with the present number of staff researchers, the progress of the Institute's projects will be delayed. As a result, the willingness of researchers in Japan will decline and research in Japan will become less attractive. Keeping this contradiction in mind, I shall present the status of plasma research from the viewpoint at the actual site regarding domestic joint research and international cooperative research (Inset is Kazuo Takayama, director, Institute of Plasma Physics, Nagoya University)

Joint Research in Japan

Fig. 1 was prepared to explain the status of joint research by categories. We have experienced joint research in Japan. However, earnest activities in international cooperation with other countries are still to come. The difference between the two is indicated by the "blank circle line" and "broken line."

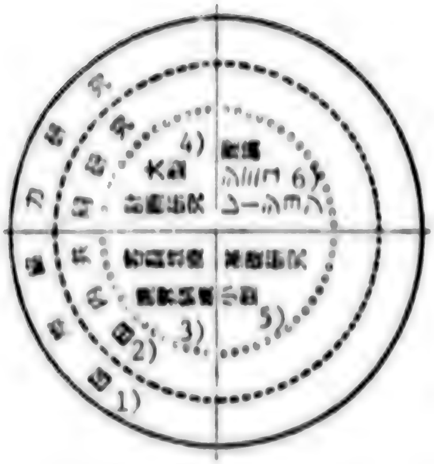

Figure 1

Key:
1. International cooperative research
2. Joint research in Japan
3. Visiting professors - marginal area
4. Large-scale planned research
5. Small-scale basic research
6. Theory - simulation

1. Selection of research goal

2. As a group, as a researcher...

3. Organization and operation

The small-scale basic research positioned at the lower left in the diagram is the area which was most actively pursued until 1973 as joint research. Several research groups were formed and dissolved in the past. I shall outline what we have learned from our experience thus far.

1. The first requisite for successful results is the proper selection of research goals. Secondly, the participants should include at least one outstanding researcher; and thirdly, to pay attention to the organization and operation. The first requisite, the selection of goals is especially important.

2. Successful results are not necessarily forthcoming by re-forming a research group with the same members who achieved good results in previous work.

3. When multiple research groups share one facility, the duration of a group's experiment is suitably divided and positioned in cycles. Moreover, various groups should have a means of mutual exchange regarding the course of progress and results.

One example is joint research using the cesium plasma facility. The projects of the three groups that participated were "Production of plasma and development of measuring methods," "Studies on echo waves of ions," and "Studies on nonlinear type electron waves." This joint research obtained many positive results in a short period of time by rotating machine time and horizontal information exchange.

The reason is simple. In other words, by having had about one third of the total experiment time and exchange of information, a researcher can understand the remaining two thirds of the experiments to almost the same degree as if he had conducted the experiments himself. It also enables him to use the data of other groups more accurately.

4. It is advantageous to have plasmas of different kinds and properties. For example, how the phenomenon discovered in cesium plasma apply to mercury plasma or high temperature, high density plasmas in a magnetic field can be quickly detected with these plasmas.

5. When theories are considered from the relationship between theory and experiment, those that are supported by experimental results in Japan are advantageously developing, but those areas where the experiments fell behind are in a disadvantageous state. A shortage of theoretical researchers is keenly felt.

6. In the past, a considerable number of medium-term visitors and sabatical year workers from overseas participated in the joint research. Most of the workers finished writing research papers and returned home with good feelings.

The openness of the Japanese researchers and the diversity of research facilities have apparently stimulated these researchers. Based on this experience, the transition of domestic joint research to international cooperative research in the small-scale basic research may be in the form of an extension of previous policies.

7. The international conference on plasma physics and engineering which is scheduled to be held in Nagoya in early April next year is a meeting that combines "the fourth international conference on waves in plasma and their instability" and "the Kiev fourth international conference on plasma theories." The parent body is the International Union of Pure and Applied Physics (IUPAP). The conferences had been held in the past only in the USSR and Europe, and the reason for the next meeting to be held in Japan, needless to say, lies in the results achieved by joint research.

8. Small-scale basic research had also been reduced unavoidably due to the second plan for plasma research that began in 1974, and it is carried out participated by a small number of staff as a single year joint research.

However, the basic research on atoms and molecules that is indispensable to plasma control and measurements, research on the state of plasma in contact with a solid and a gas, and basic research on the effective use of fused plasma must be carried out somewhere as a joint research of this type.

Visiting Professors Work in Marginal Area

The upper left hand portion of Fig. 1 shows the research by the visiting staff research category.

"Research development in nuclear fusion is not only related to an extensive range of specialized areas, but it also requires research in new areas (marginal area)." The visiting staff research category was founded by the foresight of the first director, Fushimi as expressed above. These categories are operated according to the policies set at the time of founding and are achieving successful results beyond expectation.

Two big projects undertaken in the marginal area are studies related to lasers and research on atoms and molecules including spectroscopy.

1. The reason for the successful results is the good combination in the selection of research goals, timing for the work, and the efforts of the responsible visiting professors. In addition, the background conditions that made it possible in Japan must also be cited. In other words, we had specialists and ambitious outstanding researchers in the university departments and the expert committee of the Research Institute of Plasma Physics had recommended suitable researchers from all over.

2. The project related to lasers by the visiting staff started from the development of an HCN laser of extreme infra-red rays for measurement, and the measurement of plasma density distribution was proven for the first time. The next study undertaken was the interaction of solids and a laser beam. It was an area of study that had not been undertaken by overseas plasma nuclear fusion laboratories at the time and some researchers were apprehensive about the work.

Fortunately, the results obtained by this visiting professor indicated the importance of a nonlinear effect in the interaction between a laser beam and plasma, thus attracting attention from the beginning. This work also became one of the motives that rapidly accelerated laser nuclear fusion research in America.

Subsequently, "the center for laser nuclear fusion research" was inaugurated at Osaka University. Furthermore, laser nuclear fusion came to be called an "inertial confinement method" including the relativistic electron beams and high energy ion beams and has become aligned with the "magnetic confinement method" for tokamak and mirror machines.

The next visiting staff undertook a project of laser-plasma from a different viewpoint. In other words, he directed his attention to produce high-temperature, high density plasma instantaneously by irradiating pellets. Customarily, this is done by irradiating pellets in the air. But, this method resulted in failure everywhere until then, and it is considered a difficult thing to do. This visiting staff succeeded for the first time in making the irradiation hits 100 percent. And, he developed a way for application as a new method for producing plasma in various types of magnetic fields.

3. The studies of atoms and molecules including spectroscopy began with the development of measuring methods for the vacuum ultraviolet zone. Then studies on ionization by electron shock were undertaken, followed by multivalent ion collision phenomena.

All these studies entailed research funds not available in the departments and they have shown important results at the same time presenting related new problems. Today, it has become clear that they hold important positions in nuclear fusion plasma research.

4. With the cooperation of the visiting staff and researchers of theories and experiments, "A datebook of atomic cross sections" related to plasma nuclear fusion was published ahead of other countries.

Today, atomic energy organizations are planning to prepare international data, and it has been evaluated that the datebook of the Research Institute of Plasma Physics has 10 times higher accuracy than any other data published after ours. We would very much like to maintain this evaluational standard in the future.

5. The experience in the category of the visiting staff in Japan and the achievement that has come out of the category demand the setting up of a division for overseas visiting staff. In an area where no suitable researcher is available in Japan, the visiting staff division for international cooperation is especially necessary.

For example, nuclear fusion reactor work is lagging behind, and there are some areas that are totally unrepresented. It is effective to fill these areas by the overseas visiting staff division. In the theoretical and computer simulation areas, no special ingenuity is required other than providing salary, travel expenses, housing, etc. However, in the experimental area, we cannot hope to have the researchers of our choice unless we provide good conditions for a research enrivonment including necessary funds and suitable research aides for carrying out plans. In order to maintain a high standard research in Japan, these means are necessary and will be effective if properly handled.

Large-scale Planned Research

The upper right portion of Fig. 1 represents large-scale planned research. This portion is the backbone of the 5-year plan which began in 1974, and it is being most strongly supported with the Institute researchers and funds.

The policies for the second stage are:

(1) To elucidate plasmas with higher temperatures and higher densities than those previously studied; that is, plasmas nearer to the reactor core plasma. For this purpose, the tokamak system which is useful in high temperature plasma production will be employed as well as other toroidal systems or open-end systems. In other words, the research shall be advanced by taking so-called multiphasic courses.

(2) Since the experimental scale will become larger, the facilities shall be more fully equipped.

(3) It shall be positioned as a preparatory period for carrying out future planned research.

At the starting point of this program, research using the JIPP TII unit, a toroidal magnetic system combining stellarator and tokamak, was adopted as the primary plan (See Fig. 2), and the STP program with high beta plasma as the secondary plan.

In addition, the RFC XX program was adopted as the open magnetic field system. Separately for basic research, the NBT program of mirror torus system, the SPAC program using relativistic electron beams, and a program related to lasers were adopted. Subsequently, however, the laser program was reduced due partly to the loss of laser researchers.

The framework of the second stage plan, which was proposed in 1972, appeared somewhat moderate for the strengthened positive posture of the Ministry of Education due to the subsequent oil crisis, and a computer center, a nuclear fusion research program, and an information center were newly added.

In the United States, a special survey concerning nuclear fusion was conducted (the Federal Energy Administration Hoster report, 7 June 1978), and the importance of research to replace tokamak was emphasized. In other words, the report points out that along with tokamak development to obtain scientific verification and reactor engineering data, research for replacing tokamak should be actively pursued. A similar trend is found in the USSR.

Hopeful Stellarator

Another big trend is the international cooperation of nuclear fusion which has become more active. The Japan-U.S. new energy development plan which began by the proposal of former premier Fukuda includes nuclear fusion energy, coal liquefaction, solar energy, geothermal energy, high energy physics, and photochemical synthesis; and results in the signing of the Japan-U.S. basic treaty for scientific and technological cooperation on 2 May by Premier Ohira.

As a result, the interest of U.S. researchers was focused on research at the Research Institute of Plasma Physics since the fall of last year, and more than 20 investigators have visited the Institute for the purpose of survey and liaison. The methodology to develop the research for various systems at the Research Institute of Plasma Physics is an important future project. However, it was fortunate that our concept of developing nuclear fusion research and the policies of the second stage plan were appropriate.

I shall expalin the current status of the various systems related to international cooperation according to the listed sequence in Fig. 2.

Fig. 2 Joint research and international cooperation of the Research Institute of Plasma Physics

JIPP T-II	Stellarator tokamak
STP III	Pinch tokamak
RFC XX	Radio frequency confinement
NBT	Mirror torus high temperature electron
REB	Relativistic electron beam

Plasma Physics

Basic research: Atoms and molecules of plasma
Laser and plasma
Plasma diagnostics
Reactor engineering

Theoretical: Basic theory, nuclear fusion theory

Computer center

Nuclear fusion research planning and information center

1. JIPP TII: Combined system of tokamak and stellarator. Work advanced with priority as the primary project.

As a tokamak system, it is an intermediate scale with a maximum plasma current of 160,000 amperes, a central electron temperature of 13,000,000 degrees, ionic temperature of 6,000,000 degrees, mean density of $2 \times 10^{13}/cm^{-3}$, and a confinement time of 13 miliseconds. New developments include stabilization by secondary current, simultaneous fast neutron injection heating and high frequency heating, and optimization of negative feedback control of the average field.

As for the stellarator system, 10 months were spent for repair and remounting of the helical coil, but operation began recently. It is the largest class of this type system. A heating technique experienced in tokamak operation is to be used and future results are awaited with great anticipation. The plasma which is already stable shows the characteristics of a stellarator. Overtures for stellarator operation have been received from the U.S. and the USSR.

2. Goals of the STP III program are to produce a large quantity of plasma all at once by high speed pinching and to study the tokamak configuration with high value (high beta value) of confining magnetic field efficiency.

Research participants possess the past records of improving capacitors and developing various high power switches. However, construction of the system was time-consuming, and the operation is not expected to begin until early 1980. Two researchers from the pinch group of the Paking Physics Institute joined us last spring. They are expected to stay 1 to 2 years.

3. RFC XX is an open-ended system with a cusped magnetic field on both ends. It is a method to confine terminal loss plasma by an ion cyclotron using a high frequency wave. This is a unique study of the Research Institute of Plasma Physics, and the past work done includes discovery of resonance phenomenon and its theoretical elucidation.

The goal is to obtain basic data using this system to gain insights as to the suitability of the technique for a nuclear fusion reactor. In addition to confinement, the resonance phenomenon can be applied to heating of plasma, separation of isotopes, or the manufacturing of hydrogen using plasma.

Related to this program, researchers were sent directly from DOE. And, a researcher for radio frequency confinement is scheduled to be sent to the University of Wisconsin for 2 months.

4. The program of the NBT system originates in the Elmo-Bambi Torus (EBT) and the TPM system of the Research Institute of Plasma Physics. The person in charge of this program was formerly in charge of both the experimental and theoretical studies of the U.S. Elmo-Bambi Torus program. This system exists only in the U.S. and in Japan. Since the U.S. has decided to adopt EBT as a large-scale program to follow tokamak and mirror machine, many researchers visit us from the U.S. for consultation.

5. The concept of the REB or SPAC program is to create a stable toroidal current by a relativistic high speed electron current and to heat and compress the plasma to produce the reactor core plasma. This research group produced after many trials a toroidal plasma by using an improved coaxial gun, developed new injection technique for relativistic electron current using plasma ions as the anode, and discovered the existence of an electron current that is stable for more than 1 millisecond.

On the other hand, in the U.S., the idea that came out of the studies on an open system mirror and toroidal system tokamak, namely the spheromak concept is newly attracting attention.

Experiments needed to advance the spheromak study were conducted by SPAC a step ahead. For this reason, international cooperation is strongly urged by American researchers. For the Japan-U.S. seminar, American participants are scheduled to attend from six research institutes and universities.

Note: "Ion Anode" - When a sudden negative high voltage is applied to electrodes in contact with plasma, a strong electric field is impressed and electrons are released. At the same time, these electrons are accelerated in the sheath and rush into the plasma.

The Centers

The lower right hand portion of Fig. 1 is for the theoretical computer center and nuclear fusion study planning and information center. Collaborative research is advanced by the activities of the study group and the working group.

The computer center is used jointly for studies in plasma physics and nuclear fusion, simulation for research in related fields, analyses of large scale numerical values, processing of experimental data, and literature information processing. In addition, it is also used for software development, on-line processing of experiments by a large system, etc.

The planning and information center is conducting information gathering and survey analyses with the cooperation of researchers in a wide range of fields.

From Domestic Joint Research to International Cooperative Research

As shown in Fig. 2, the research conducted at the Research Institute of Plasma Physics covers a wide range from plasma physics, studies on atoms and molecules, interaction of laser and solids, to theories and an information center. In addition, the program research is emphatically advanced by using four systems. You may feel a sense of wonder at the fact that so many studies are being pursued, but this is made possible by following reasons.

One reason is the active use of domestic joint research and visiting staff research. In other words, it results from outside assistance. Another reason that cannot be overlooked is the advanced technology and support of the Japanese industry. Needless to say, the Institute staff members are working with full force. The current state of research at the Institute is virtually near the limit, and it is to the degree that this condition cannot be allowed to continue too long.

Let us compare the Research Institute of Plasma Physics in Japan to the Max-Planck Plasma Institute in West Germany. The time of foundation is one year earlier for West Germany. In Japan, following the oil crisis, both personnel and research funds were increased by the second stage plan. However, research funds at the Research Institute of Plasma Physics during the past five years totalled 14.5 billion yen, which is equivalent to 1-1/2 years' research funds in West Germany. And, the number of personnel after 19 years is less than the number of staff in the second year in West Germany. (Note: From what we hear, the research institutes in West Germany seem to have a lifetime employment system.)

Next, let us cite examples in China.

With the exception of laser research, the plasma work at the physics institute in Peking employs 95 people, and the Ssunan Physics Institute in Sichuan Province employs a total of approximately 1,000 people. Their group for the mirror machine using a superconducting coil is composed of 200 people, which is more than the total number of personnel at the Research Institute of Plasma Physics including the staff at the residential quarters.

In the Netherlands, there are two plasma-nuclear fusion research institutes: the Institute for Plasma Physics in Jutphaas and the Institute for Atomic and Molecular Physics in Amsterdam. The number of staff totals 150 for each institute. Atomic and molecular research at the Research Institute of Plasma Physics in Japan is conducted by some visiting staff at the Institute and joint research.

There are some parts of research programs that can be efficiently managed by collaborative work with university departments. However, a large portion of the anticipated future research programs should be advanced by the Institute staff carrying the responsibilities.

Cooperative research is planned based on the Japan-U.S. treaty for science and technology. In the United States, there are four national research institutes and research centers at several universities, and private firms are also moving in a positive manner.

The number of researchers assigned to the primary plan of the Research Institute of Plasma Physics, JIPP TII is 20, and the SPAC program has only six researchers. In the case of a research project using a large scale system, a shortage of staff affects the speed of progress. If international cooperation begins on a subject desired in the present condition of near limit, the difference in the number of researchers will become a burden.

Up against a heavy wall of the Total Personnel Strength Law, we must find a means to increase the number of researchers. One hopeful method is to increase research activities at universities through "special research" within the scientific research fund.

As for plasma research, the third stage plan had been proposed and it is making progress. The goals are to positively direct research on nuclear burn-up plasma and to establish basic research for reactor engineering, and to forcefully advance the study on the tokamak replacement system. The total expense is approximately 100 billion yen, and the personnel requested numbered approximately 600.

If you have a bright idea regarding the increase of research staff at the Institute, I would like to hear from you. I believe that it is a necessary condition for achieving long-term international cooperation.

Part II - Osaka University

Progress made in Laser Nuclear Fusion Research--A Practical Reactor by Early 21st Century

The laser nuclear fusion research center of the Osaka University (director: C. Yamanaka) is advancing inertial confinement nuclear fusion research programs. Great success has been achieved on glass laser by plasma compression experiment this year using "Gekiko [violent beam] IV." Finally, the "Kongo [Golden] Plan" will start in 1980 with a 10-year plan to achieve breakeven and to gain some insights for feasibility of glass laser nuclear fusion. In the first 5 years, the "Gekiko XII" with an output of 20 kilojoule shall be developed, and the "energy driver" with an output of 100 kilojoule, in the latter 5 years. As for the carbon dioxide laser, standing on the experimental results of the "Rekko [blazing beam] II," the "Rekko III" with an output of 10 kilojoule is under construction with a 2-year plan in 1979-80. Using these experimental results as a foundation, the "laser nuclear fusion experimental reactor" will be constructed in the 1990s, and by the 2000s, a practical reactor will probably be completed. In March of this year, the center completed the first conceptual plan for an experimental reactor "inertial confinement nuclear fusion reactor" with an output of 1 megajoule to be constructed in the 1990s. The United States entered the plan to complete "NOVA" with an output of 300 kilojoule in 1984. Steady developmental research is also being advanced in Japan. (Inset is director Yamanaka)

Aiming for Fusion Output Equal to the Input Energy

The ten-year plan "Kongo Project" (Total construction cost of approximately 62 billion yen--see the separate column) will start in 1980 with a goal of materializing breakeven to obtain a nuclear fusion output equal to the input energy. This "Kongo Project" is divided into the first 5-year plan (1980-84) and the latter 5-year plan (1985-89).

In the first half period, the goals are three-fold: 1) to complete the "Gekiko XII glass laser" (a 12-beam phosphate glass laser with an output of 20 kilojoule), 2) to develop a pellet publication [fabrication] (fuel balls), and 3) to develop a target chamber (an experimental measuring system), as well as to conduct basic research on a new type laser in preparation for the latter period plan.

In the latter period, the plan is to gain an insight for feasibility (scientific verification) by achieving breakeven by building a laser of 100 kilojoule. As to what form it takes will be determined based on the research on the new type laser in the first 5-year plan. The laser nuclear fusion research center at Osaka University has been advancing research and development of the "Gekiko Program" which is to become the foundation for the "Kongo Project."

In other words, we succeeded in producing approx. 10^7 (10 million) neutrons by irradiating pellets with the "Gekiko IV laser" (4 terawatts, 100 picosecond pulse), and compressing with instantaneously generative bombardment called exploding pression at the stage of January this year. This was followed by an experiment of gradual, adiabatic compression called agrative [translation] implosion.

The revolutional change in pellet structure made adiabatic compression possible even though the laser irradiated was the same.

The pellets used in bombarding compression are glass microballoons packed with deuterium to 10 atmospheric pressure. In the case of adiabatic compression, a polymer layer of polyethylene was placed on the outside of the glass microballoons. When the laser hits the polymer layer of the polyethylene, the polyethylene becomes plasma and is expelled outward. The center is compressed by this reaction.

Three methods were used to measure the compression results: X-ray spectrometry, X-ray backlighting (a method to expose X-ray from behind and the quantity passed is used to measure the density of the spot) and a high speed streak camera. The centers of pellets were compressed to 5 gm/cm^3.

This is, for the present, the highest compression rate in the world. However, this is the limit with "Gekiko IX" and the compression rate cannot be increased unless a one scale larger laser is used. Thus, the next step is the "Kongo Project."

Progress made in Collaborative Research including Manufacturers

The work of the "pellet target development committee" at this Center consists of 1) technical development of glass microballoons (section 5, Osaka Government Industrial Research Institute, Agency of Industrial Science and Technology, Ministry of International Trade and Industry), 2) plastic microballoons (school of engineering, Kinki University), 3) cryogenic targets (Mitsubishi Atomic Power Inc., Inc.), 4) polyethylene polymerization techniques (Meijo University), 5) handling of pellets (dept. of electric engineering, Faculty of Engineering, Tokyo University), 6) tritium (Shinroihi, Inc.), 7) plastic polymerization (Sumitomo Denko K.K.), and 8) instrumentation (Shimazu Seisakusho, Inc.), and technical development of fuel pellets continues.

In the "Kongo Project," the goals are to realize a compression rate of 100g/cm^3 in the first half period and 1000g/cm^3 in the latter period.

The work of the "Gekiko XII glass laser development committee" consists of 1) laser body, alignment (beam convergence technique), measurement (Nippon Elec. Co., Ltd.), 2) laser glass (Hoya Glass Co., Ltd.), 3) flash lamp (Ushio Elect. Co.), large scale laser grinding technology (Canon, Inc.), 5) polymeric dielectric film vapor deposition technique (Showa Kiko Seizo K.K.); and the construction is to take place led by the Nippon Elect. Co., Ltd.

As for laser glass, Hoya Glass Co., Ltd. developed a phosphate glass that surpasses the world's standard based on the research conducted at Osaka University for over 10 years, and they continue to develop even more superior glasses. In addition, a fluorophosphate glass is currently being developed.

With regard to optical grinding, work up to 50cm aperture has become possible at a sufficient lamda in wavelength precision. A grinding technique for a larger aperture as well as an inspection technique are scheduled for development.

A coating technique has a yield strength of 5 joule/cm^2, but efforts are being made to improve the laser yield strength to about 10 joule/cm^2. This work for improved yield strength is being developed by Showa Koki with a large scale vapor deposition machine.

Flash lamp performance has greatly improved, showing a superior performance to those manufactured in the U.S. The product materialized by eliminating the causes for breakage based on the data of Osaka University. They are expected to be exported to the U.S. in the future.

Conceptual Design already Underway for the Next Stage Plan

At the laser nuclear fusion research center of Osaka University, the "research committee on an inertial confinement nuclear fusion reactor" has been established in order to design a "reactor" for the next plan in the "Kongo Project." They completed the first stage conceptual design for an inertial confinement nuclear fusion reactor in March of this year.

The constituent members of this committee led by this center include the Research Institute of Plasma Physics of Nagoya University, Tokyo Institute of Technology, Japan Atomic Energy Research Institute, Mitsubishi Atomic Power Industry, Inc., Ishikawajima-Harima Heavy Industries Co., Ltd., Hitachi Energy Research Institute, Kawasaki Heavy Ind., Ltd., Sumitomo Shipbuilding and Machinery Co., Ltd., atomic reactor experiment station of Kyoto University, National Research Institute for Metals of the Science and Technology Agency, Radiation Center of Osaka Prefecture, and Kanazawa University. The first stage conceptual design was completed in about one year.

To summarize the design, 1) a pellet gain of 1000 grams is possible when a laser with an output of 1 megajoule is used. 2) Since an inertial confinement nuclear fusion reactor is pulse-driven, it has been thought to be very difficult to realize. However, when a fluidized lithium wall blanket is used, the energy generated here is buffered considerably, and damage to the reactor wall is greatly reduced.

If such design is employed, the flux can be reduced to about one megawatt/m^2, and the generated particle energy is reduced to about 1/10. Thus, it was concluded that the number of useful years of the reactor can be as long as 5-10 years.

In addition, this reactor is characterized by the fact that the laser that radiates energy and the reactor that produces energy are separate.

In the case of magnetic field confinement, the fact that these two units are built as one resulted in a very complicated structure from the engineering point of view. Thus, inertial confinement is thought to have more developmental possibilities.

It is very difficult to evaluate the manufacturing cost of electric power using a laser nuclear fusion reactor. However, calculations based on the cost of construction, etc. resulted in a power generation cost of 3.8 yen/kilowatt/hr when the pellet gain is about 1000 grams.

In conclusion, the requirements are: 1) technology to manufacture fuel balls with a pellet gain of approximately 1000 grams, and 2) laser technology for generating 1 megajoule.

Then, they need only to decide what to choose for the 1 megajoule energy driver by 1990.

Large Scale and Advantageous Carbon Dioxide Laser Also

Carbon dioxide lasers are also promising along with glass lasers. The larger the carbon dioxide lasers, the more advantageous they are.

The "Rekko Program" of this Center has currently in operation "Rekko I" and "Rekko II." The "Rekko I" has an output of 1 kilojoule, and a pulse width of 80 nanoseconds; and "Rekko II' has a 1 kilojoule output with 3-nanosecond pulse width.

The Center is currently building the "Rekko III" having an output of 10 kilojoule and eight beams, which is scheduled to be completed in 1980. Of the eight beams, four beams will be completed in 1979 and the remaining four beams in 1980.

The members of the carbon dioxide laser development committee include 1) Ushio Denki (carbon dioxide laser body), 2) Nisshin Electric Co., Ltd. (power supply equipment), 3) Nitto Denko K.K. (plastic body of the laser), 4) Dainichi Electric Wire and Cable Co., Ltd. (high voltage cables), and K.K. Tokuda Seisakusho (vacuum equipment).

"Rekko III" is a laser with a 10 micron wavelength, which enables experiments on difficult compression states from that of the glass laser. It has a potential for reactor development following the "Kongo Project."

For basic development of laser energy driver other than glass and carbon dioxide lasers, the center is advancing basic studies on krypton fluoride lasers, HF (hydrogen fluoride) lasers, and free electron lasers assigned to various universities.

Interaction of Electron Beams and Plasmas

Another program is "Reiden [excited electron] III" which has been in operation for some time at this center as a basic experiment on the one-shot energy injection technique using relativistic electron beams.

These are electron beams of approximately 500 kilowatts and 100 kiloamperes. When converted to energy, it is about 5 kilojoule with a pulse width of about 40 nanoseconds. It is the system used for an experiment on the interaction of electron beams and plasmas, which produced very interesting data. The data produced were very helpful in fixing the worldwide knowledge that electron beams may be utilized in nuclear fusion.

A system one size larger than the above, called "Reiden IV," began operation this year. At 1 megavolt and 1 megaampere, the beam is 100 kilojoule with a pulse width of 50 nanoseconds.

In addition, an injection technique for light ion beams and heavy ion beams are under consideration.

The light ion beams can be generated by reversing the electric polarity of the relativistic electron beam system. Research and development are about to begin at Kanazawa University and the Res. Inst. of Plasma Physics, Nagoya University.

The heavy ion beam requires a heavy ion source of high power current of approximately 20 billion electron volts and 10 kiloamperes. In other words, it requires a large scale accelerator that is larger than the 12 billion volt proton synchrotron located at the high energy physics research institute of the Ministry of Education in Tsukuba research campus city.

There is a trend for studying these ion beams in the future in various countries.

The target radiation energy for glass laser, carbon dioxide laser, electron beams and ion beams is all 1 megajoule when the reactor is built. Developmental target is set in the 1990s.

As stated, research and development of laser nuclear fusion in Japan is being advanced steadily with a goal of completing the practical reactor in the early 2000s by going through steps of achieving breakeven by the end of the 1980s and completing the experimental reactor in the 1990s.

Development of New Measuring Method begins in 1980

The research and development structure for laser nuclear fusion is as follows: The "Kongo Project" of the laser nuclear fusion research center of Osaka University requires 11 groups in the first half period. However, five groups which include group I (laser material), group II (laser dynamic characteristics), group III (laser simulation), group IV (laser energy), and group V (laser pellets) are currently installed, and a new installation of group VI (laser diagnostics) is requested in the JFY 1980.

A group to manufacture lasers, a group to evaluate lasers with a computer, and a group to make pellets have been established to date. However, in the first half period of the "Kongo Project," the laser pulse will be 100 picoseconds with 0.1 mm pellets. Conventional methods cannot be used to measure the temperature and density that will result upon irradiation. Therefore, it is necessary to develop a new diagnostic (measuring method) beginning in 1980.

The new measuring method means development of the abovementioned X-ray spectrometry, X-ray backlighting, and high speed streak camera. Among these, the world market for a high speed camera used to be dominated by a British firm, John Hatland. However, Hamamatsu Television (K.K.) developed a superior high speed streak camera which has become famous worldwide. Plans include the development of these instruments and their utilization in actual measurements.

In addition, director Yamanaka emphasizes that the research structure should be developed into a "laser energy research institute" in order to achieve breakeven in the latter period 5-year plan of the "Kongo Project."

Budget Outline of Kongo Project

Gekiko XII glass laser - 5.5 billion yen (JFY 1980-82)

Pellet target development system - 621 million yen (JFY 1980-82)

Nuclear fusion exploding pression experimental system - 1.9 billion yen (JFY 1981-84)

100 kilojoule class driver module - 1.8 billion yen (JFY 1982-84). 1) 100 kilojoule glass laser module development - 1.4 billion yen = large aperture new type laser glass (10), 300 million yen; special grinder for the new type laser glass (one set), 100 million yen; high efficiency laser amplifier module (two sets), 5 million yen; large scale, high beam resistant, and large aperture vapor deposition machine for polymeric dielectric film (one set), 100 million yen; laser system simulation calculation codes (one set), 50 million yen; laser glass characteristics measuring unit (one set), 50 million yen; large scale laser control system module (one set), 300 million yen. 2) New energy driver basic development - 400 million yen = high beam resistant infrared optical components, 110 million yen; 1 kilojoule new laser module, 70 million yen; REB compression experiment module, 120 million yen; high power current ion source (one set) 100 million yen.

The first term plan total = 9,821 million yen

100 kilojoule class energy driver - 35 billion yen (JFY 1985-87) 1) laser glass, 13 billion yen; 2) optical components, 8 billion yen; 3) power supply, 10 billion yen, 4) control system, 4 billion yen (JFY 1986-87).

Breakeven experiment system - 17.2 billion yen (JFY 1987-89) 1) laser glass, 13 billion yen; 2) optical components, 8 billion yen; 3) power supply, 10 billion yen, 4) control system, 4 billion yen (JFY 1987-89); optical elements, 8 billion yen (same as above); surveillance and control system, 1 billion yen (1988-89); 2) breakeven chamber = target chamber, 4 billion yen (JFY 1987-89); special radiation protection, 500 million yen (1988, 89); measuring instruments, 2.5 billion yen (JFY 1987-89); minicomputer for measures data analysis, 200 million yen (JFY 1989); 3) high-gain pellet manufacturing system, 1 billion yen (JFY 1987-89); 4) computer for total system surveillance and control, 1 billion yen (JFY 1988-89).

Part III - Kyoto University

Nuclear Fusion Reactor "Heliotron"--A Japanese Product

The Heliotron nuclear fusion program is being carried out in Japan independently from the intial concept to the research and development. Unlike the totamak type, it has an advantage of having a potential as a stationary reactor. At present, the Heliotron nuclear fusion research center of Kyoto University (director: (Koji Ubi?) is conducting experimental studies with the Heliotron D and Heliotron DM system. The "Heliotron E program" (JFY 1976-79) for the production of plasma that is one scale below nuclear fusion plasma is in its final stage. The Heliotron E system will be completed by March next year (1980), and experiments will begin in April. Based on the results, the "Heliotron F program" aiming at the production of critical corr lasma is expected to start from JFY 1981.

Difficult Conditions of Artificial Sun

The Heliotron nuclear fusion research center was established at Kyoto University in 1976. Its forerunner is the superthermal plasma research facilities established in the Faculty of Engineering, Kyoto University. However, production and confinement experiments of high temperature plasma for nuclear fusion were carried out priot to that at Kyoto University.

"Heliotron" is derived from the Greek word for sun, "Helios." The research and development of Heliotron nuclear fusion are characterized by plasma confinement using a Heliotron magnetic field.

Nuclear fusion reactions are the source of energy of the sun. In other words, atomic nuclei of hydrogen, which are light nuclei, fuse to form heavy nuclei such as Helium and release tremendous amount of energy. The fuel deuterium is abundantly present in water.

However, in order for man on earth to actually induce the nuclear fusion reaction with control, many problems have to be solved. First, since deuterium nuclei are positively charged, it is necessary to provide energy to overcome their electrostatic repulsion. To do this, the hydrogen must be heated to a sufficiently high temperature of about 100 million degrees. In a superthermal state, the electrons in an atom that are orbiting around the nucleus are separated from the nucleus to become ionized. Such a state of a matter is called "plasma."

Into a "Vessel" of Invisible Magnetic Field

These hydrogen nuclei in the state of plasma collide with each other causing a nuclear fusion reaction and become helium nuclei. However, the probability of a nuclear fusion reaction to occur is very small. Thus, in order to sustain the nuclear fusion reaction and to achieve a nuclear fusion reactor, not only the temperature, but the product of the plasma density and the time of stable presence of plasma (plasma confinement time) must exceed a certain fixed value.

When deuterium and tritium are used as fuel, among which the reaction occurs most readily, this value is 10^{20} (sec/m^3). This condition combined with the temperature condition (100 million degrees) are the conditions for a nuclear fusion reactor called "Lawson conditions."

Consequently, in order to materialize a nuclear fusion reactor with magnetic field confinement, it is necessary first to make a stable plasma, heat it to a sufficiently high temperature, and to increase the value of the density-confinement time product.

In order to confine plasmas, a special vessel unlike ordinary substances is necessary. If an ordinary solid vessel is used, the walls of the vessel will melt due to the high temperature of the plasma. Therefore, by applying the property of charged particles (atomic nuclei, electrons) that move wrapped around a magnetic lines, a method used is to completely cover a confined curved surface with magnetic lines and to confine the plasma inside. [Approximately 150 words missing from text]

One Scale Higher than DM Type - Surpasses "Tokamak" as a Practical Reactor

Among these systems, the one which produces plasma that meets the conditions for a nuclear fusion core plasma is the tokamak system. However, in the case of a tokamak system, plasma is confined only when the inductive current is flowing in the plasma, and without the electric current flow, the plasma cannot be confined. [Approximately 650 words missing from text]

Part IV - Manufacturers Collaborating in Nuclear Fusion Development Firms working with the Research Institute of Plasma Physics, Nagoya University

Hitachi, Ltd. - Sustained plasma heating unit for toroidal system (JIPP-stellarator; Nichicon Capacitor, Ltd. - Synchromak unit; Nisshin Electric Co., Ltd., Nichicon Capacitor, Ltd., Kyoto Ceramic - Plasma compound compressor (STP-II); Kotobuki Iron Works, Ltd. - Relativistic electron beam generator (PHOEBUS-V); Ulvac Corporation, Toshiba Corporation, Toshiba Denko Co., Ltd. - Dynamically controlled sustained plasma heater (RFC-XX); Toshiba Corp., Osaka Shinku [Osaka Vacuum], Mitsubishi Electric Corporation - Relativistic plasma holding unit (TPM-II).

K.K. Toyama, Meidensha Electric Mfg., Ltd., Ulvac Corp. - Dynamically controlled sustained plasma heater (TPM-III); Varian Associates - High power klystron; Okura Trading Co., Ltd. - Klystron power supply; Meishi Koko - 5-stage amplification glass laser; Nippon Electric Co., Ltd. - Laser unit for plasma generation; Fujitsu, Ltd. - Computer system (M-190); Chuo Seisakusho Ltd. - Nagoya Bambi Torus (NBT); Tohoku Metal Ind., Ltd., Daia Shinku Giken [Daia Vacuum Tech. Lab.] - Turbulent heating experiment unit (Zamak II); Nagoya Aircraft Manufacturing Plant of Mitsubishi Heavy Ind., Ltd. - Neutron particle injection unit.

Osawa Shokai - Image converter camera; Hamamatsu Television - SIT television camera; Sony Tektronix - Oscilloscope; Nippon Kogaku Kogyo K.K. - Vacuum spectroscope; Toyo Communication Equipment Co., Ltd. - Rangent [sic] [transient] recorder; Chubu National - Thermoluminescence dosimeter; Hitachi, Ltd., Ulvac Corp. - TPD-I; Haskel Engineering - Ultra-high pressure generator (UHP); Osumi Denki Seizo, Koyo Kiki, K.K. Toyama, Nippon Kogaku Kogyo, Nippon Elect., Mitsubishi Elect., Toyo Comm. Equip. - Semistationary high density plasma generator (TPH).

Hakuto Co., Ltd. - Electron beam generator (made by Physics International); Osumi Denki Seizo - Nagoya Bambi Torus coil; Ulvac Corp. - Nagoya Bambi Torus vacuum vessel system.

Firms working with the laser nuclear fusion research center of Osaka Univ.

Nichicon Sales - Faraday rotator system for glass laser; Sony Corp. - Television camera, video equipment; ILC Technology Inc. - Flash lamp; EG & G, Inc. - flash lamp; OCLI [Optical Coating Laboratory, Inc.] - vapor-deposited film polarizing plate; Hamamatsu Television - Television camera for measurement, SIT television camera for measurement, pyricon [?] camera; Osaka Vacuum - Vacuum chamber and exhaust system for plasma generation; Daisan Kogyo - Power supply for driving pulse motor, program timer; Ushio Denki - High output pulse carbon dioxide laser, flash lamp, carbon dioxide laser amplifier for stabilizing electron beam.

Nisshin Elect. - power supply for the high output pulse carbon dioxide laser; Nippon Sekigaisen Kogyo [Japan Infrared Ind., Ltd.] - Optical elements for carbon dioxide laser; Columbia - Infrared spectroscope; Nippon Elect. - Large output glass laser system, CWYAG laser, helium neon laser; Canon - Aspherical lens; Hoya Glass - various laser glasses; Oki Electric. Ind., Co., Ltd. - Glass laser control and data processing system; Terasaki Denki Sangyo - Glass laser photoelectric apparatus; Nippon Kogaku Kogyo - various lenses, optical apparatus.

Meisho Kiko - Glass laser amplifier; Kondo Ko - special vacuum filter for glass laser; Nihon Minopore [Millipore] - Pure water system, various liquid filters; Showa Koki Seizo - Vapor deposited polymeric dielectric mirror for high output laser; Daido Sanso K.K. - Liquid nitrogen; Shizuki Denki Seisakusho - Capacitors; Off-vac - Vacuum exhaust system; Shiraimatsu Kiki - Large aperture NaCl window plate; Nitto Seikei Kogyo - FRP discharge chamber for carbon dioxide laser; Rigaku Denki - X-ray microscope; Nihon Laser - S-3 firm electron beam carbon dioxide laser.

Shimazu Seisakusho, Ltd. - X-ray crystal spectrometer; Japan Electron Optics Lab. Co., Ltd. - Electron microscope; Osawa Shokai - Streak camera; Nihon Bunko Kogyo - Spectrometer; Okamoto Kogaku Kakojo - Various optical parts grinding; Kyozu Keisosha - Various laser apparatus; Osaka Valve Fitting - Valves; Rikei - Measuring instruments; Neriki - Gas; Chuo Seiki - Optical parts; Tohrisha - cryogenic apparatus; Aroka - cryogenic apparatus; Fuji Electric Mfg. Co., Ltd. - Radiation measuring instruments; Hitachi, Ltd. - Spectrophotometer; Fujitsu, Ltd. - Infrared detectors; Nippon Elect.-Varian - Mass spectrograph; Yokogawa Elect. Works, Ltd. - XY-recorder.

Firms working with the Heliotron nuclear fusion research center of Kyoto Univ.

Fujitsu, Ltd. - PANAFACOM-U-700; Nisshin Elect. - Large current potential transformer (STO-ULN-II) DC capacitor bank (NUG-100 type); Kurita Seisakusho - Baking heater control panel; Hitachi Denshi - 150 GHz band 1 CH interferometer; Hitachi, Ltd. - Vacuum exhaust system for Heliotron DM, helical coil feeding unit for Heliotron DM; Fuji Musen Denki - 10 CH time controller; Shimazu Seisakusho, Ltd. - Helium lead detector, masspec [transliteration] analyzer for quadrupole mass spectrometer.

Yokogawa-Hewlett-Packard - Oscilloscope made by Hewlett-Packard (U.S.), vector impedance meter; Sony-Tektronix - Dual beam oscilloscope made by Tektronix (U.S.); Nihon Denshi - Laser amplifier; Tokyo Denshi Giken - Air core coil; Kogaku - Monochrometer; Toa Electron - Tracking scope; Osaka Shinkuki Seisakusho - Axial flow molecular pump system; Hitachi, Ltd. - Heliotron high temperature plasma experimental system, strong magnetic field Heliotron DM high temperature plasma experimental system; Hitachi Denshi - Plasma diagnostics system.

Leading Development in Power Supply

Nichicon Capacitor, Ltd. - The company began to develop a capacitor power supply for the generation of a magnetic field from the early days of nuclear fusion research, and their technology has been highly evaluated. Awarded by the research commission fund for peaceful uses of atomic energy by the Science and Technology Agency in 1958, they began to work in full scale development of the above power supply.

Subsequently, the company delivered the first Japanese plasma compression power supply unit with an ignitron cross bar switch (10 Kv, 52 Kj) to the

Research Institute of Plasma Physics established at Nagoya University. In addition, they developed the common power supply of the Institute, the high speed discharge capacitor power supply (40 Kv, 210 Kj; 5 Kv, 250 Kj) as well as the JIPP-II capacitor power supply (20 Kv, 450 Kj) and the STP system capacitor power supply, etc. one after another.

All of them are capacitor power supply systems of largest scale in Japan. The big features of these units are the fact that inspite of being subjected to instantaneous large currents and high voltages, they remain accurate, are easy to use, and automated as experimental units by advanced technology of electronic controls.

In addition, the company also delivered a similar type power supply to the superthermal physics and engineering research facilities of Osaka University, Electrotechnical Laboratory, and Japan Atomic Energy Research Institute. Furthermore, as nuclear fusion development became diversified, they are now engaged in the development of instantaneous voltage generators as a source to generate relativistic electron beams.

Coping with Experimental Advancement

Shizuki Seisakusho - The company has been cooperating with nuclear fusion development of universities and research institutes since the latter part of the 1950s working in the development of capacitors for low inductance and large current. They have manufactured various kinds of capacitor power supplies for magnetic field generation and capacitor power supplies for laser tubes.

These capacitors include those for slow use with a relatively long discharge cycle and those for fast use with a short cycle. Capacitors manufactured for slow use are below 60nH per KJ at below 10 KV, and for fast use, less than 8nH per KJ at 100 KV.

In addition, they also manufacture a systematized unit with combined capacitor discharge circuits as the power supply for large current generation. This unit is comprised of a charger, discharge switch, pulse generator, loading coil, control unit, etc. Thus, a technology that can sufficiently cope with the advanced experimental system has been established.

Cooperation by the Entire Technical Group

Meisho Kiko - The company (148 Numa, Higamicho, Higami-Gun, Hyogo-Ken) is designing and manufacturing according to the request of various universities and institutes, principally the laser nuclear fusion research center of Osaka University. Consequently, they are not delivering standardized products to universities and institutes, but depending upon products, some are standardized.

In particular, at the laser nuclear fusion research center of Osaka University, the glass laser "Gekiko IV" achieved good results, and experimental preparation for the next "Gekiko VII" is rapidly making progress. With the carbon dioxide laser, the Rekko III is making progress, and the "Kongo Project" is in the planning and preparation stage.

Sensing the world-wide energy crisis since about 10 years ago, the company joined this nuclear fusion research program and is cooperating with universities and institutes using the company's technology as the basis to respond to their needs.

Recent major deliveries made include (1) DIIO disk amplifier house, various rod amplifier houses, and their accessories, and various mirror holders for Gekiko IV use; (2) beam converter unit, various Rogorskiy [transliteration] electrodes for Rekko III use; and (3) a beam converter unit for Kongo Project is under designing and construction.

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CSO: 4105

SPACE PROGRAMS IN AND AFTER FY 1980

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 p 9

[Text]

The Space Activities Commission has decided on space exploration programs in and after FY 1980 starting in April, calling for launching of two broadcasting satellites in FY 1983 and 1985, research and development of the 10th scientific satellite and Tokyo University's scientific space experiments using particle accelerators in FY 1982 instead of FY 1981.

The commercial broadcasting satellites will have almost the same performance as the experimental medium broadcasting satellite launched in 1978. They will be placed in geostationary orbit over the western tip of Borneo Island by N-II rockets now under development.

The scientific satellite, named "Planet A," will be launched by Tokyo University for research into interplanetary plasma near Earth and Venus, optical observation of Venus' atmosphere, and other experiments.

The commission has also decided to consider the recent failure in putting an experimental communications satellite on a geostationary orbit, although causes of the failure are unknown. Existing data show radio waves from the satellite, named "Ayame (iris)-II," stopped eight seconds after an apogee motor was fired. They also indicate abnormal functions of the apogee motor. Although various causes for the failure have been cited, the commission plans to send a mission to the United States for one week from April 6 for further investigations into the cause of malfunction.

CSO: 4120

SCIENCE AND TECHNOLOGY

SPACE INDUSTRY SHOWS STEADY GROWTH

Tokyo JPE AVIATION REPORT-WEEKLY in English 9 Apr 80 pp 7, 8, 9

[Text]

An average annual sales growth of 6.5 percent was registered by the Japanese space industry in the four years, FYs 1975-78, according to the "Space Industry Status Report" compiled by the Japan Federation of Machine Industry Companies. The first in depth report on the Japanese space industry was published March 28. The status of the industry was as of October 1979 and covered 65 companies which generated 98 percent of the total sales.

Sales in FY 1975 totaled ¥87,400 million. Sales totaled to ¥102,200 million in FY 1976 dropped to ¥84,700 million in FY 1977, and rose to ¥105,400 million in FY 1978. About 52 percent of the annual sales came from rockets and satellites and related parts, while ground facilities accounted for about 41 percent, the rest was made up by software.

Since export of rocket projectiles is restricted, items exported were 96 percent related to ground facilities. Export sales totaled ¥10,800 million in FY 1975, ¥12,300 million in FY 1976, ¥10,600 million in FY 1977, and ¥23,600 million in FY 1978. Sales to Asia and the Near and Middle East occupied 39.3 percent, to Africa and Oceania 25.1 percent, and to Europe 17.5 percent.

One noteworthy trend is that export sales exceeded imports in FY 1978. Imports were ¥32,100 million in FY 1975, ¥36,000 million in FY 1976, ¥21,300 million in FY 1977, and ¥18,100 million in FY 1978.

During FYs 1975-78, the industry made capital investments totaling ¥13,300 million, 60 percent went for projectiles, 29 percent for ground facilities, and 11 percent for software.

Research and development efforts are being promoted with increased funds. Total funds in FY 1975 were ¥2,700 million compared to ¥4,568 million for FY 1978. The average annual growth rate in the four years was 19 percent. Of the aggregate research and development funds in the four years, 43 percent each were spent for projectiles and ground facilities, and 14 percent for software. In terms of ratio against sales amounts, R&D funds for projectiles were 3 percent, ground facilities 3.8 percent, and software 6.6 percent.

The number of employees engaged in the space industry was 4,200 in FY 1975 and increased to 5,740 in FY 1978. Of these employees 36.8 percent are engaged in research and development projects. Companies engaged in the space industry are mainly large enterprises.

Of the ¥105,400 million sales in FY 1978, ¥53,800 million covered rockets and satellites and ¥47,000 million covered ground facilities.

CSO: 4120

SCIENCE AND TECHNOLOGY

JAPANESE STEEL MAKER TO COMPUTERIZE PRODUCTION LINES OF U.S. STEEL MILL

Tokyo KYODO in English no time given 4 Apr 80 OW

[Text] Osaka April 4 KYODO--Sumitomo Metal Industries, Ltd. the Osaka-based major steelmaker, will technologically help United States Steel Corp. computerize the production lines of its mill at Baytown, Texas, industry sources said Friday.

According to the sources, Sumitomo is to extend the assistance to U.S. Steel at the latter's request.

It will be Sumitomo's second instance of such cooperation with the top American steelmaker.

The first was clinched in January when Sumitomo Metal contracted to give technological guidance to U.S. Steel in integrated production processes for large steel pipes--from steelmaking to continuous casting, plate production and further to pipe production.

U.S. Steel, not content with merely modernization of its pipe production under its current rehabilitation policy, asked Sumitomo Metal for help in computerizing the mill's entire production lines.

Computerization of production is believed to be one of the secrets of the Japanese steel industry's success in attaining the world's top level in both productivity and product quality.

Quoting the management of Sumitomo Metal, the sources said the company decided to comply with the second request in its belief that such cooperation will contribute to easing recurring Japan-U.S. trade friction over Japan's steel exports to the U.S.

The company found it difficult to refuse, although it admitted a possible undesirable "boomerang" effect.

By "boomerang" effect was meant a resurgence of U.S. Steel's production capacity to affect Japanese steel exports.

The U.S. is the world's most computerized country. But U.S. Steel has computerized only its administrative work and only a few of its mills. Most of its many mills scattered across the country are very old and their unionized workers object to manpower-cutting production line modernization, according to the sources.

But the company, forced by recession to lay off many mill hands, found it necessary to computerize its Baytown mill, whose production lines could be operated with just a skeleton crew if so modernized.

Nippon Steel Corp., Japan's largest steelmaker, last January started helping U.S. Steel carry out a comprehensive scrap-and-build mill modernization program in addition to helping since January last year in repairing the latter's Gary, Indiana, mill blast furnaces.

CSO: 4120 END

SELECTIVE LIST OF JPRS SERIAL REPORTS

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MONGOLIA REPORT
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